

Memorandum

To: Amy Hambrick, U.S. EPA, Sector Policies and Programs Division/Natural Resources and Commerce Group

From: Roy Oommen, ERG

Date: June 2010

Subject: Estimation of Baseline Emissions from Existing Sewage Sludge Incineration Units

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA), under section 129 of the Clean Air Act (CAA), is required to regulate emissions of nine pollutants and opacity from sewage sludge incineration (SSI) units: hydrogen chloride (HCl), carbon monoxide (CO), lead (Pb), cadmium (Cd), mercury (Hg), particulate matter (PM), dioxins/furans (CDD/CDF mass basis and toxic equivalency (TEQ) basis), nitrogen oxides (NO_x), and sulfur dioxide (SO₂). In order to assess the affects of regulatory requirements on these pollutants, it is first necessary to determine their emissions at the current level of control at each SSI unit. These emissions are referred to as the baseline emissions.

This memorandum describes the development of baseline emissions estimates for existing sources in the SSI source category. Section 2.0 discusses the sources of data used in the development of the baseline emission estimates, Section 3.0 presents the methodology used to estimate baseline emissions, and Section 4.0 summarizes the results of this analysis. Table 1-1 summarizes the baseline emissions estimated for the nine section 129 pollutants regulated by SSI emission guidelines for existing sources in two subcategories, multiple hearth (MH) incinerators, and fluidized bed (FB) incinerators. Baseline emissions of PM_{2.5} were calculated from emissions data collected by EPA and assuming that controls applicable for PM would also reduce PM_{2.5}.

Table 1-1. Summary of Baseline Emissions for Existing SSI Units (tons per year)

Sub-category	Cd	Pb	Hg	HCl	SO ₂	NO _x	CO	PM	PM _{2.5}	CDD/CDF (mass) ^a	CDD/CDF (TEQ) ^a
MH	2.83	6.06	3.05	123	3,080	7,360	29,000	1,100	666	0.000020	0.0000013
FB	0.010	0.053	0.07 6	2.99	134	327	120	56.6	54.2	0.000083	0.0000068

^aBecause emissions information for FB units collected were only for SSI units with ACI, the back-calculation method for CDD/CDF results in overestimates of the baseline emissions. This is an artifact of the methodology. Technical papers on SSI units indicate that total hydrocarbon emissions should be lower for FB units than MH units.⁵

2.0 DATA SOURCES

Emissions information on SSI units was collected from two sources. An information collection request (ICR) survey was sent to nine owners of SSI's units, who provided

characterization information (costs, controls, operating information) for their units.¹ The survey respondents also provided emissions test data from 16 SSI units. Some of the tests were conducted in response to the ICR; other test reports were for tests conducted within five years prior to the ICR request. A second source of emissions information was test reports collected from State environmental agencies' public databases for nine SSI units (all MH units). The emission tests in these reports were conducted between 2000 and 2009. The emissions information and ICR responses are further discussed in the memorandum, "Facility, Unit, and Emissions Test Database for the Sewage Sludge Incineration Source Category".¹

Baseline emissions were calculated for 218 SSI units, of which 163 have the MH combustor design and 55 have the fluidized bed FB combustor design. As indicated above, emissions information was gathered on 25 SSI units (20 MH and 5 FB units). The information in the emissions test reports were then applied to the other SSI units based on their characteristics and controls. The inventory of SSI units is discussed in the memorandum, "Inventory Database for the Sewage Sludge Incineration Source Category".²

3.0 METHODOLOGY FOR ESTIMATING BASELINE EMISSIONS

All the emissions information collected were for stack tests conducted following all the control devices, i.e., controlled emissions at the baseline level of control. For units where emissions information was gathered, the average concentration of the individual test runs was used to calculate their baseline emissions. If multiple tests were conducted for a unit, then the average was calculated as the average of all the test runs. Baseline emissions on an annual basis were calculated from the concentration reported in the test information (either parts per million volume dry (ppmvd), milligrams per dry standard cubic meter (mg/dscm), or nanograms per dry standard cubic meter (ng/dscm)), the flue gas flow rate of the emission stream (in dry standard cubic feet per minute (dscfmm)), and the hours of operation of the unit. Attachment A shows the calculations used for converting concentration values to emission rates.

For the remaining units where emissions information was not available, baseline emissions were calculated using an average concentration factor, average flow rate factor, and default hours of operation. The development and use of these parameters is discussed in this section.

3.1 Assignment of Concentrations

In order to calculate baseline emissions for all units, an average concentration was calculated from the known information and assigned to the remaining units without data. First, the uncontrolled average concentration for each unit with test data was calculated using the following equation:

$$\text{Uncontrolled Concentration} = (\text{Controlled Concentration}) \div [1 - (\% \text{ control efficiency}/100)]$$

The control efficiencies used in the calculation are presented in Table 3-1. The efficiencies were based on assumptions used in previous EPA regulations, particularly the industrial, commercial, and institutional boiler NESHAP, and incorporate engineering judgment based on information provided by EPA testing personnel, internet web searches, and EPA technical documents and fact

sheets on control devices.³⁻⁵ For this analysis, whenever there were multiple control devices affecting the same pollutant, the highest reduction efficiency for all the controls was used. For example, if a unit had a venturi scrubber and a fabric filter, the control efficiency of the fabric filter for cadmium and lead control was assigned to the combination because fabric filters are more efficient in controlling these pollutants. While some additional control may be achieved from multiple controls in series, most of the controls currently used at SSI units do not generally overlap in their effectiveness for most pollutants. The assumption also provides the most conservative estimate of performance. Although some units use thermal oxidizers or afterburners and achieve lower CO emissions levels, reduction efficiency was not assigned to them for CO because data were not available to determine a percent reduction value. For these units, the baseline level of CO emissions will be overstated. FGR has been used on combustion devices to reduce NO_x emissions. However, the amount of NO_x reduced varies widely, ranging from 20 percent to 80 percent, and site-specific factors often affect the performance. Emissions test data collected by EPA showed that one unit providing emission test data operates a MH unit with FGR. However, its emission levels are similar to units without FGR. So no conclusion could be made on FGR performance. Emission tests conducted at 5 FB units and 6 MH units included emissions data on PM_{2.5}. This data was used to calculate baseline emissions assuming controls applicable to PM would also reduce PM_{2.5}.

Once all concentration data were converted to uncontrolled levels, all the uncontrolled data points for a pollutant in a subcategory were averaged to develop average uncontrolled concentration levels. Table 3-2 presents the average uncontrolled concentrations calculated for each pollutant in the MH and FB subcategories.

Table 3-2. Average Uncontrolled Concentrations Applied to SSI Units without Data^a

Subcategory	Cd	Pb	Hg	HCl	SO ₂	NO _x	CO	PM	PM _{2.5}	CDD/CDF (mass) ^b	CDD/CDF (TEQ) ^b
	mg/dscm	mg/dscm	mg/dscm	ppm	ppm	ppm	ppm	mg/dscm	mg/dscm	ng/dscm	ng/dscm
MH	0.89	1.91	0.114	13.1	186	133	854	722	439	0.70	0.047
FB	0.043	0.221	0.015	2.48	66.1	27.9	16.3	249	236	16	1.31

^aConcentrations are at 7 percent oxygen.

^bBecause emissions information for FB units collected were only for SSI units with ACI, the back-calculation method for CDD/CDF results in overestimates of the uncontrolled concentrations. This is an artifact of the methodology. Technical papers on SSI units indicate that total hydrocarbon emissions should be lower for FB units than MH units.⁵

The average uncontrolled levels developed for each pollutant were then used to estimate emissions after application of existing controls (referred to as baseline emissions) for each SSI unit without emissions data by applying the pollutant control efficiencies (from Table 3-1) for the control devices currently in use (as identified in the SSI inventory database). The following equation was used:

$$\text{Baseline Concentration} = (\text{Uncontrolled Concentration}) \times [1 - (\% \text{ control efficiency}/100)]$$

3.2 Development of Flow Rate Factor

The flue gas flow rate exiting the SSI units where data were not available was calculated by using a flow rate factor relating flue gas flow rate to the dry tons of sludge fired in the

incinerator. The sludge feed rates for the surveyed units were provided in the emission test reports collected. An average flue gas flow rate factor from all the test data was then calculated for each subcategory. The flow rate factor for MH units was calculated to be 9,642.5 dscfm/dry tons per hour of sludge. The flow rate factor for FB units was calculated to be 5,455.7 dscfm/dry tons per hour of sludge.

A flow rate was then calculated for each SSI unit without information by multiplying the flow rate factor by the dry sludge feed rate of each SSI unit. For units where average sludge feed rates were not known, unit capacities were multiplied by a capacity utilization factor of 75 percent, which was the median of the capacity utilizations reported in the ICR survey responses.¹ More information about how unit capacity values were obtained can be found in the SSI inventory database memorandum.²

3.3 Development of Default Operating Time

For some of the surveyed SSI units, the operating time was provided.¹ However, these varied for each unit and no consistent pattern could be identified. For this analysis, the assumption was made that facilities with only one SSI unit would be operating the unit the entire year (8,400 hours assuming 2 weeks downtime). Facilities with two units would be operating one unit one year and the second unit the next, averaging to 4,200 hours for each if normalized to a yearly basis. Facilities with even numbers of units followed this assumption. Facilities with three units were assumed to be operating two units the majority of the year (8,400 hours) and one unit would be a backup and operate 360 hours (assuming operation during 2 weeks downtime for other units).

4.0 SUMMARY OF RESULTS

Attachment B presents the baseline concentrations and calculated emissions for each pollutant and at each SSI unit. Attachment C presents the dry sludge capacity, sludge feed rate, flue gas flow rate, and operating hours for each SSI unit.

5.0 REFERENCES

1. Facility, Unit, and Emissions Test Database for the Sewage Sludge Incineration Source Category. Memorandum from Eastern Research Group to Amy Hambrick, U.S. Environmental Protection Agency. June 2010.
2. Inventory Database for the Sewage Sludge Incineration Source Category. Memorandum from Eastern Research Group to Amy Hambrick, U.S. Environmental Protection Agency. June 2010.
3. Development of Baseline Emission Factors for Boilers and Process Heaters at Commercial, Industrial, and Institutional Facilities. Memorandum from Amanda Singleton and Graham Gibson, Eastern Research Group to Jim Eddinger, U.S. EPA. April 2010.
4. Technology Transfer Network, Clean Air Technology Center.
<http://www.epa.gov/ttn/catc/products.html>

5. A Comparison of Fluid Bed and Multiple Hearth Biosolids Incineration. Ky Dangtran, John Mullen, and Dale Mayrose. Paper presented at the 14th Annual Residuals and Sludge Management Conference. February 27-March 1, 2000, Boston MA

Table 3-1

Control Efficiency Assumptions

Table 3-1. Control Efficiency Assumptions for Baseline Emissions Estimates¹

Subcategory	Controls ²	CdEfficiency	PbEfficiency	HgEfficiency	HClEfficiency	SO2Efficiency	NOxEfficiency	COEfficiency	D/FEfficiency	PMEfficiency
FB	vs	0.95	0.95	0	0	0	0	0	0	0.95
FB	vs - cs	0.95	0.95	0	0	0.95	0	0	0	0.95
FB	vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
FB	vs - imp - wesp	0.98	0.98	0.1	0.95	0.95	0	0	0	0.99
FB	ccpt	0.95	0.95	0.1	0.98	0.95	0	0	0	0.9
FB	cs - vs - pbt	0.95	0.95	0.1	0.98	0.98	0	0	0	0.95
FB	vs(ad) - wesp	0.98	0.98	0.1	0.98	0.98	0	0	0	0.99
FB	abd - mc - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
FB	abo - imp - wesp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.99
FB	abd - vs - imp - hss - cs	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
FB	ac inject. - bag - vs(ad) - wesp	0.99	0.99	0.88	0.93	0.95	0	0	0.98	0.99
FB	vs- imp - wesp - ac polish.	0.98	0.98	0.88	0.93	0.95	0	0	0.98	0.99
MH	abd - imp	0.5	0.5	0.1	0.95	0.95	0	0	0	0.9
MH	abd - vs	0.95	0.95	0	0	0	0	0	0	0.95
MH	abd - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	abo - cs - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	abo - fgr - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	abo - imp	0.5	0.5	0.1	0.95	0.95	0	0	0	0.9
MH	abo - imp - wesp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.99
MH	abo - fgr - vs(ad) - imp	0.95	0.95	0.1	0.98	0.98	0	0	0	0.95
MH	abo - vs	0.95	0.95	0	0	0	0	0	0	0.95
MH	abo - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	abo - vs - vs	0.95	0.95	0	0	0	0	0	0	0.95
MH	abo/fgr - pbs - vs - imp	0.95	0.95	0.1	0.98	0.98	0	0	0	0.95
MH	abd - vs - imp - wesp	0.98	0.98	0.1	0.95	0.95	0	0	0	0.99
MH	agr - vs - imp - wesp - rto	0.95	0.95	0.1	0.95	0.95	0	0	0	0.99
MH	cs - vs(ad)	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	hjs - imp	0.5	0.5	0.1	0.95	0.95	0	0	0	0.9
MH	imp	0.5	0.5	0.1	0.95	0.95	0	0	0	0.9
MH	va - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.9
MH	vs	0.95	0.95	0	0	0	0	0	0	0.95
MH	vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	vs - imp - rto	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	vs - imp - wesp	0.98	0.98	0.1	0.95	0.95	0	0	0	0.99
MH	vs - imp - wesp - rto	0.98	0.98	0.1	0.95	0.95	0	0	0	0.99
MH	vs - wesp	0.98	0.98	0	0	0	0	0	0	0.99
MH	vs - wesp - rto	0.98	0.98	0	0	0	0	0	0	0.99
MH	vs(a)	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	vs(ad)	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	vs-imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	ws - vs - imp	0.95	0.95	0.1	0.95	0.95	0	0	0	0.95
MH	ws - vs - pbs - vs(ad)	0.95	0.95	0.1	0.98	0.95	0	0	0	0.95
MH	ws - vs - pbs - ringjet	0.95	0.95	0.1	0.98	0.98	0	0	0	0.95
FB	unknown	0.95	0.95	0	0	0	0	0	0	0.95
MH	unknown	0.95	0.95	0	0	0	0	0	0	0.95

Control Abbreviations:

Abbreviation	Control
abd	detached afterburner
abo	on-hearth afterburner
ac inject.	activated carbon injection for mercury control
ac polish.	activated carbon polishing for mercury control
agr	acid gas removal system
bag	baghouse
ccpt	counter-current packed tower
cs	cyclone separator
cs/tg	twin gas cyclonic scrubber
fgr	flue gas recirculation
hjs	horizontal gas scrubber
hss	hydrosonic scrubber
imp	impingement tray scrubber
pbs	packed bed scrubber
pbt	packed bed tower
rto	regenerative thermal oxidizer
vs	venturi scrubber
vs(ad)	venturi pak or ring jet scrubbers
wesp	wet electro static precipitator
whs	wet hydrosonic scrubber
ws	wet scrubber (undefined)
mc	multiclone

¹ Information based on analysis conducted in the memorandum "Development of Baseline Emission Factors for Boilers and Process Heaters at Commercial, Industrial, and Institutional Facilities". From Amanda Singleton and Graham Gibson, Eastern Research Group to Jim Eddinger, U.S. EPA. April 2010 and using studies and analyses in U.S. EPA's Technology Transfer Network,Clean Air Technology Center. <http://www.epa.gov/ttn/cat/products.html>

² Email from Robert Dominak, Co-Chair NACWA Biosolids Management Committee, to Amy Hambrick, U.S. EPA, on 8/5/2009: "SSI Inventory Updated Information." Attachment: SSI_Inventory (RPD 8-5-09).xls

Attachment A

Conversion of Units

The following calculations were used to develop ton/year emission estimates:

PM, Pb, Cd and Hg

Concentration "X" given in mg/dscm, flow rate "FR" in dscf/minute (dscfm), and annual hours "H" (hours/year):

$$\frac{[X(\text{mg/dscm}) \times FR(\text{dscf/min}) \times 60(\text{min/hr}) \times H(\text{hr/year})]}{[35.3147(\text{dscf/dscm}) \times 453,592(\text{mg/lb}) \times 2,000(\text{lb/ton})]} = (\text{ton/yr})$$

CDD/CDF

Concentration "X" given in ng/dscm, flow rate "FR" in dscf/minute (dscfm), and annual hours "H" (hours/year):

$$\frac{[X(\text{ng/dscm}) \times FR(\text{dscf/min}) \times 60(\text{min/hr}) \times H(\text{hr/year})]}{[35.3147(\text{dscf/dscm}) \times 1,000,000 (\text{ng/mg}) \times 453,592(\text{mg/lb}) \times 2,000(\text{lb/ton})]} = (\text{ton/yr})$$

HCl, NO_x, SO₂, CO

Concentration "X" given in ppmvd, flow rate "FR" in dscf/minute (dscfm), annual hours "H" (hours/year), and molecular weight "MW" as follows: HCl = 36.45, NO_x = 46, SO₂ = 64.06, CO = 28.01:

$$\frac{[X(\text{ppmv}) \times MW(\text{lb/lbmol}) \times FR(\text{dscf/min}) \times 60(\text{min/hr}) \times H(\text{hr/year})]}{[1,000,000 \times 385.5(\text{dscf/lbmol}) \times 2,000(\text{lb/ton})]} = (\text{ton/yr})$$

Attachment B

**Baseline Concentrations and Calculated Emissions
for Each Pollutant and at Each SSI Unit**

Attachment C

Baseline Emission Calculation Inputs

Attachment C. Baseline Emission Calculation Inputs

FacilityID	UnitID	Capacity(dtph)	Feedrate dtph	Flow Rate dscfm	OperationalHours
AKJohnMASplund	1	2.69	2.02	19,458.10	8400
AKJuneau	1	2.26	1.69	9,239.97	8400
CACentralContraCosta	MHF 1	2.50	1.95	23,131.60	4200
CACentralContraCosta	MHF 2	2.50	1.54	22,925.33	4200
CAPaloAlto	1	2.69	2.02	19,458.10	4200
CAPaloAlto	2	2.69	2.02	19,458.10	4200
CTHartford	001	2.50	2.38	17,216.87	6016
CTHartford	002	2.50	2.30	16,359.80	6016
CTHartford	3	2.50	1.88	18,079.69	360
CTMattabassett	1	2.26	1.69	9,239.97	8400
CTNaugatuck	1	2.69	2.02	19,458.10	4200
CTNaugatuck	2	2.69	2.02	19,458.10	4200
CTSynagroNewHaven	1	2.69	2.02	19,458.10	4200
CTSynagroWaterbury	1	2.26	1.69	9,239.97	4200
CTWestHaven	1	2.26	1.69	9,239.97	8400
GANoondayCreek	1	2.26	1.69	9,239.97	8400
GAPresidentStreet	1	0.38	0.29	2,776.52	4200
GAPresidentStreet	2	0.38	0.29	2,776.52	4200
GARLSutton	1	0.25	0.19	1,807.97	4200
GARLSutton	2	0.25	0.19	1,807.97	4200
GARMClayton	1	1.25	0.94	9,039.84	4200
GARMClayton	2	1.25	0.94	9,039.84	4200
GAUtoyCreek	1	1.75	1.31	12,655.78	4200
GAUtoyCreek	2	1.75	1.31	12,655.78	4200
GAWeyerhaeuser	1	3.52	2.64	25,453.62	8400
IACedarRapids	1	3.92	2.94	28,348.95	8400
IADubuque	1	1.70	1.28	6,956.02	4200
IADubuque	2	1.70	1.28	6,956.02	4200
INBelmontNorth	1	2.60	2.03	7,085.00	4200
INBelmontNorth	2	2.60	2.15	19,574.28	4200
INBelmontNorth	3	2.60	2.12	7,888.33	4200
INBelmontNorth	4	2.60	2.09	20,699.23	4200
INBelmontNorth	5	2.00	1.50	7,661.67	4200
INBelmontNorth	6	2.00	1.50	20,409.96	4200
INBelmontNorth	7	2.00	1.50	7,413.33	4200
INBelmontNorth	8	2.00	1.50	20,184.97	4200
KSKawPoint	1	2.26	1.69	9,239.97	4200
KSKawPoint	2	2.26	1.69	9,239.97	4200
LANewOrleansEastBank	1	2.26	1.69	9,239.97	4200
LANewOrleansEastBank	2	2.69	2.02	19,458.10	4200
MAFitchburgEast	1	2.30	1.72	16,597.15	8400
MALynnRegional	1	2.26	1.69	9,239.97	4200
MALynnRegional	2	2.26	1.69	9,239.97	4200
MAUpperBlackstone	1	3.00	1.79	6,271.00	8544
MAUpperBlackstone	Incinerator 3	3.00	1.96	14,421.33	216
MDWesternBranch	1	1.08	0.81	7,810.43	4200
MDWesternBranch	2	1.08	0.81	7,810.43	4200
MIAnnArbor	1	2.69	2.02	19,458.10	8400
MIBattleCreek	1	2.69	2.02	19,458.10	4200
MIBattleCreek	2	2.69	2.02	19,458.10	4200
MIDetroitComplex1	1	2.69	2.02	19,458.10	4200
MIDetroitComplex1	2	2.69	2.02	19,458.10	4200
MIDetroitComplex1	3	2.69	2.02	19,458.10	4200
MIDetroitComplex1	4	2.69	2.02	19,458.10	4200
MIDetroitComplex1	5	2.69	2.02	19,458.10	4200
MIDetroitComplex1	6	2.69	2.02	19,458.10	4200
MIDetroitComplex2	1	2.69	2.02	19,458.10	4200

Attachment C. Baseline Emission Calculation Inputs

FacilityID	UnitID	Capacity(dtph)	Feedrate dtph	Flow Rate dscfm	OperationalHours
MIDetroitComplex2	2	2.69	2.02	19,458.10	4200
MIDetroitComplex2	3	2.69	2.02	19,458.10	4200
MIDetroitComplex2	4	2.69	2.02	19,458.10	4200
MIDetroitComplex2	5	2.69	2.02	19,458.10	4200
MIDetroitComplex2	6	2.69	2.02	19,458.10	4200
MIDetroitComplex2	7	2.69	2.02	19,458.10	4200
MIDetroitComplex2	8	2.69	2.02	19,458.10	4200
MIFlint	1	2.69	2.02	19,458.10	4200
MIFlint	2	2.69	2.02	19,458.10	4200
MIFlint	3	2.69	2.02	19,458.10	4200
MIFlint	4	2.69	2.02	19,458.10	4200
MIPontiacAuburn	1	2.69	2.02	19,458.10	8400
MIWarran	1	2.69	2.02	19,458.10	8400
MIYpsilanti	EU-FBSSI	3.46	2.85	14,465.29	3240
MNSeneca	Incinerator 1	1.58	1.34	16,607.25	4000
MNSeneca	Incinerator 2	1.58	1.42	15,605.93	4000
MNStPaulMetro	FBR1	5.42	4.19	21,897.67	7270
MNStPaulMetro	FBR2	5.42	3.94	20,984.05	7270
MNStPaulMetro	FBR3	5.42	3.76	19,858.57	7270
MOBigBlueRiver	1	2.69	2.02	19,458.10	4200
MOBigBlueRiver	2	2.69	2.02	19,458.10	4200
MOBigBlueRiver	3	2.69	2.02	19,458.10	360
MOBissellPoint	1	2.69	2.02	19,458.10	4200
MOBissellPoint	2	2.69	2.02	19,458.10	4200
MOBissellPoint	3	2.69	2.02	19,458.10	4200
MOBissellPoint	4	2.69	2.02	19,458.10	4200
MOBissellPoint	5	2.69	2.02	19,458.10	4200
MOBissellPoint	6	2.69	2.02	19,458.10	4200
MOLEMAY	1	2.69	2.02	19,458.10	4200
MOLEMAY	2	2.69	2.02	19,458.10	4200
MOLEMAY	3	2.69	2.02	19,458.10	4200
MOLEMAY	4	2.69	2.02	19,458.10	4200
MOLittleBlueValley	1	2.26	1.69	9,239.97	8400
MORockCreek	1	2.26	1.69	9,239.97	8400
NCBuncombeAshville	1	2.26	1.69	9,239.97	8400
NCRockyRiver	1	2.97	2.23	21,464.21	8400
NCTZOsborne	ES-1	3.25	2.42	10,281.48	8400
NHManchester	1	2.00	1.50	8,183.55	8400
NJAtlanticCounty	1	2.69	2.02	19,458.10	4200
NJAtlanticCounty	2	2.69	2.02	19,458.10	4200
NJBayshoreRegional	1	2.26	1.69	9,239.97	4200
NJBayshoreRegional	2	2.26	1.69	9,239.97	4200
NJCamden	1	2.26	1.69	9,239.97	8400
NJGloucester	1	2.26	1.69	9,239.97	4200
NJGloucester	2	2.26	1.69	9,239.97	4200
NJMountainView	#1	0.79	0.80	7,697.93	2715
NJMountainView	#2	0.79	0.80	9,267.18	2715
NJNorthwestBergen	1	2.26	1.69	9,239.97	4200
NJNorthwestBergen	2	2.26	1.69	9,239.97	4200
NJParsippanyTroyHills	1	2.69	2.02	19,458.10	4200
NJParsippanyTroyHills	2	2.69	2.02	19,458.10	4200
NJPequannockLincolnFairfield	1	2.26	1.69	9,239.97	4200
NJPequannockLincolnFairfield	2	2.26	1.69	9,239.97	4200
NJSomersetRaritan	1	0.65	0.49	2,659.65	4200
NJSomersetRaritan	2	1.33	1.00	5,438.65	4200

Attachment C. Baseline Emission Calculation Inputs

FacilityID	UnitID	Capacity(dtph)	Feedrate dtph	Flow Rate dscfm	OperationalHours
NJStonyBrook	1	2.69	2.02	19,458.10	4200
NJStonyBrook	2	2.69	2.02	19,458.10	4200
NYAlbanyCountyNorth	1	2.69	2.02	19,458.10	4200
NYAlbanyCountyNorth	2	2.69	2.02	19,458.10	4200
NYAlbanyCountySouth	1	2.69	2.02	19,458.10	4200
NYAlbanyCountySouth	2	2.69	2.02	19,458.10	4200
NYArlington	1	0.35	0.26	1,432.12	8400
NYAuburn	1	2.69	2.02	19,458.10	8400
NYBirdIsland	1	14.04	10.53	101,547.58	8400
NYBirdIsland	2	14.04	10.53	101,547.58	8400
NYBirdIsland	3	14.04	10.53	101,547.58	360
NYErieCounty	1	0.78	0.59	3,196.70	4200
NYErieCounty	2	0.78	0.59	3,196.70	4200
NYFrankEVanLare	1	2.69	2.02	19,458.10	8400
NYFrankEVanLare	2	2.69	2.02	19,458.10	8400
NYFrankEVanLare	3	2.69	2.02	19,458.10	360
NYGlensFalls	1	1.54	1.16	6,301.33	8400
NYNewRochelle	1	2.69	2.02	19,458.10	4200
NYNewRochelle	2	2.69	2.02	19,458.10	4200
NYNorthwestQuadrant	1	2.69	2.02	19,458.10	8400
NYOneidaCounty	1	0.84	0.63	3,416.63	8400
NYOneidaCounty	2	0.84	0.63	3,416.63	8400
NYOneidaCounty	3	0.84	0.63	3,416.63	360
NYOrangetown	1	2.69	2.02	19,458.10	8400
NYOssining	1	2.69	2.02	19,458.10	4200
NYOssining	2	2.69	2.02	19,458.10	4200
NYPortChester	1	2.26	1.69	9,239.97	4200
NYPortChester	2	2.26	1.69	9,239.97	4200
NYSaratogaCounty	1	1.44	1.08	5,881.93	8400
NYSchenectady	1	2.69	2.02	19,458.10	8400
NYSouthwestBergenPoint	1	4.92	3.69	35,556.72	4200
NYSouthwestBergenPoint	2	4.92	3.69	35,556.72	4200
NYTonawanda	1	2.69	2.02	19,458.10	8400
OHCanton	1	1.08	0.81	7,810.43	4200
OHCanton	2	1.08	0.81	7,810.43	4200
OHColumbusSoutherly	1	3.00	2.25	21,695.63	4200
OHColumbusSoutherly	2	3.00	2.25	21,695.63	4200
OHColumbusSoutherly	3	3.00	2.25	21,695.63	4200
OHColumbusSoutherly	4	3.00	2.25	21,695.63	4200
OHEuclid	1	2.69	2.02	19,458.10	4200
OHEuclid	2	2.69	2.02	19,458.10	4200
OHJacksonPike	1	2.32	1.74	16,806.88	4200
OHJacksonPike	2	2.32	1.74	16,806.88	4200
OHLittleMiami	1	3.00	2.25	12,275.33	8400
OHMillCreek	1	4.00	3.00	28,927.50	4200
OHMillCreek	2	4.00	3.00	28,927.50	4200
OHMillCreek	3	4.00	3.00	28,927.50	4200
OHMillCreek	4	4.00	3.00	28,927.50	4200
OHMillCreek	5	4.00	3.00	28,927.50	4200
OHMillCreek	6	4.00	3.00	28,927.50	4200
OHNEORSDEasterly	1	2.26	1.69	9,239.97	8400
OHNEORSDSouthery	1	3.60	2.70	26,034.75	4200
OHNEORSDSouthery	2	3.60	2.70	26,034.75	4200
OHNEORSDSouthery	3	3.60	2.70	26,034.75	4200
OHNEORSDSouthery	4	3.60	2.70	26,034.75	4200

Attachment C. Baseline Emission Calculation Inputs

FacilityID	UnitID	Capacity(dtph)	Feedrate dtph	Flow Rate dscfm	OperationalHours
OHNEORSDWesterly	1	1.79	1.34	12,945.06	4200
OHNEORSDWesterly	2	1.79	1.34	12,945.06	4200
OHWilloughbyEastlake	1	3.42	2.57	24,733.01	8400
OHYoungstown	1	2.00	1.50	14,463.75	4200
OHYoungstown	2	2.00	1.50	14,463.75	4200
PAAlleghenyCounty	001	3.25	1.88	10,256.72	8400
PAAlleghenyCounty	002	3.25	1.88	10,256.72	8400
PADelawareCountyWester n	1	2.69	2.02	19,458.10	4200
PADelawareCountyWester n	2	2.69	2.02	19,458.10	4200
PAEastNorritonPlymouthW hitpain	1	2.69	2.02	19,458.10	8400
PAErie	1	2.69	2.02	19,458.10	4200
PAErie	2	2.69	2.02	19,458.10	4200
PAHatfield	1	2.69	2.02	19,458.10	8400
PAKiskiValley	1	2.69	2.02	19,458.10	8400
PAUpperMorelandHatboro	1	2.69	2.02	19,458.10	8400
PAWyomingValley	1	2.26	1.69	9,239.97	8400
PRPuertoNuevo	1	2.26	1.69	9,239.97	8400
RICranston	1	0.95	0.71	6,863.39	4200
RICranston	2	1.98	1.48	14,310.50	4200
RINewEngland	1	2.69	2.02	19,458.10	8400
SCColumbiaMetro	1	1.08	0.89	4,620.17	7300
SCColumbiaMetro	2	1.08	0.68	5,144.67	7300
SCEFelixCDavis	1	2.26	1.69	9,239.97	8400
SCPlumIsland	1	2.69	2.02	19,458.10	8400
VAArmyBaseNorfolk	1	1.50	0.82	8,455.33	4200
VAArmyBaseNorfolk	2	1.50	1.13	10,847.81	4200
VABlacksburg	1	2.26	1.69	9,239.97	8400
VABoatHarbor	1	1.79	1.64	11,399.17	4200
VABoatHarbor	2	1.79	1.34	12,957.11	4200
VAChesapeakeElizabeth	1	1.50	1.12	7,908.33	4200
VAChesapeakeElizabeth	2	1.50	1.13	10,847.81	4200
VAHLMooney	2	2.26	1.69	9,239.97	8400
VAHopewell	1	2.69	2.02	19,458.10	8400
VANomanCole	1	1.88	1.41	13,559.77	4200
VANomanCole	2	1.88	1.41	13,559.77	4200
VANomanCole	3	3.83	2.88	27,722.19	4200
VANomanCole	4	3.83	2.88	27,722.19	4200
VANomanCole	5	1.58	1.19	11,450.47	4200
VANomanCole	6	1.58	1.19	11,450.47	4200
VAVirginiaInitiative	1	1.88	2.08	16,866.67	4200
VAVirginiaInitiative	2	1.88	1.41	13,559.77	4200
VAWilliamsburg	1	1.96	1.55	6,500.56	4200
VAWilliamsburg	2	1.96	1.47	14,162.42	4200
WAAnacortes	1	2.26	1.69	9,239.97	8400
WABellinghamPostPoint	1	2.69	2.02	19,458.10	4200
WABellinghamPostPoint	2	2.69	2.02	19,458.10	4200
WAEEdmonds	1	2.26	1.69	9,239.97	8400
WALynnwood	1	2.26	1.69	9,239.97	8400
WAWestside	1	2.42	1.81	9,888.46	8400
WIGreenBayMetro	1	1.23	0.92	8,909.67	4200
WIGreenBayMetro	2	1.23	0.92	8,909.67	4200